Environmental Report:
Trimont Wind Project

Jackson and Martin Counties
MPUC Docket #IP-6339/CN-03-1841
Trimont Wind I, LLC

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1.0 General Project Description

1.1 Project Description

The project under review here is called the Trimont Area Wind Farm (Project). This Project is a large wind energy conversion system (LWECS), as defined in the Wind Siting Act, Minnesota Statutes §§ 116C.691–116C.697. This Project is also a large energy facility (LEF), as defined in Minnesota Statutes §§ 216B.2421. The Project is located in Cedar Township (Township 104 N, Range 33 W, Sections 7-9, 16-21, 28-30) in Martin County and in Kimball Township (Township 104 N, Range 34 W, Sections 8-17, 20-29, 34-36) in Jackson County. The Project site contains approximately 22,400 acres. The Project will be sited in the area surrounding Great River Energy's Lakefield Junction Generating Plant, a 550 megawatt (MW) peaking plant.

The Project will generate electricity using up to 67 wind turbines with a rated capacity of 1.5 megawatts each. The Project will have a combined net electric generating capacity of approximately 100 MW. Assuming an estimated net capacity factor of approximately 39 percent, projected average annual output would be 342,000 megawatt hours (MWh). Output will be dependent on final design, site-specific features, and equipment.

1.2 Project Proposers

Trimont Area Wind Farm, LLC, is a limited liability company comprising more than 40 local farmers and landowners in the Trimont area who own land covering 35 square miles straddling the Martin-Jackson county line. Trimont Area Wind Farm, LLC, was selected through a competitive bidding process by Great River Energy (GRE) to acquire renewable resources to help GRE meet Minnesota's Renewable Energy Objective (REO). The Renewable Energy Objective is a state policy directing electric utilities to make a good faith effort to provide 10% of their electricity from renewable resources by 2015. Minn. Stat. 216B.1691, subd. 2.

Trimont Area Wind Farm, LLC, has entered into a Development and Purchase Option Agreement with a second limited liability company called Trimont Wind I, LLC (Trimont). Trimont is an Oregon limited liability company that is an unregulated, wholly-owned subsidiary of PPM Energy, Inc. PPM Energy is an international company that owns and manages wind projects around the world, including a 51 megawatt project along Buffalo Ridge in Murray and Pipestone counties under the name Moraine Wind, LLC.

Under the terms of the Development and Purchase Option Agreement between the two companies, the individual owners of Trimont Area Wind Farm would receive traditional lease payments for turbine siting and own an interest in the Project's gross revenues through a revenue participation interest deed. Trimont Wind I, the Oregon company, will design, construct, finance, operate, and maintain the Project. Trimont Wind I has applied to the Environmental Quality Board for a Site Permit for the Project.

1.3 Summary of Environmental Report Process

On November 18, 2003, Trimont filed an application for a Certificate of Need (CON) with the Public Utilities Commission (PUC) to construct the Project. On December 22, 2003, the PUC issued an order accepting the application as substantially complete once Trimont filed supplemental materials with the PUC. Trimont filed the requested supplemental materials on January 12, 2003.

Under rules promulgated by the Environmental Quality Board in early 2004, the EQB is the responsible governmental unit required to prepare an Environmental Report on large energy projects for which a certificate of need is required from the PUC. Minn. Rules parts 4410.7010–4410.7070. In its December 22 Order, the PUC requested that staff from the Environmental Quality Board (EQB) prepare an Environmental Report as required by Minn. Rules 4410.7020 (See Appendix A). This Environmental Report is the first such report prepared by the EQB under these rules.

MEQB staff has followed the process for preparing an Environmental Report outlined in Minn. Rules 4410.7030. Interested persons were notified of the project by mail and a project page was constructed on the MEQB's website. In accordance with Minn. Rules 4410.7030, subp. 3, MEQB staff held public meetings on the project on January 13, 2004, and February 3, 2004, in Trimont, Minnesota. The public was provided with an opportunity to ask questions, present comments, and suggest alternatives and possible impacts to be evaluated in the Environmental Report. The public comment period closed on February 24, 2004. A summary of the public comments can be found in Appendix D.

On March 8, 2004, Environmental Quality Board Chair Robert A. Schroeder issued an order determining alternatives and items to be addressed in the Environmental Report and the schedule for completion of the Environmental Report. The Scoping Order is available in Appendix D.

2.0 General Description of Project Alternatives

Minn. Rules 4410.7035, subp. 1.B requires the Environmental Report to address alternatives to the proposed project. The purpose of an Environmental Report is to provide the Public Utilities Commission and the public with information on the potential environmental impacts of a proposed project and of alternatives to the project. Normally, that would involve comparing the impacts of burning coal with burning natural gas or other fuels and with the impacts of using renewables or constructing additional transmission facilities.

In this case, however, since the proposed project is a wind project intended to address Great River Energy's obligations to increase its use of renewable resources for electricity generation, there is no reason to evaluate the impacts of 100 megawatts of generation from fossil fuels or the impacts associated with the use of increased transmission. Indeed, in its December 22, 2003, Order finding the certificate of need application to be complete, the PUC eliminated these alternatives from the mix. Therefore, this Environmental Report analyzes the potential impacts associated with the Trimont Project and the impacts of two alternatives to the proposed project: (1) another 100 megawatt wind project in some other location; and (2) a biomass plant.

In addition, the Environmental Report discusses the impacts of not building the project. By statute the only time the no-build alternative will be considered is when the Public Utilities Commission determines the need for a proposed large energy facility. Minn. Stat. § 116C.53, subd. 2 ("When the public utilities commission has determined the need for the project under section 216B.243 or 216B.2425, questions of need, including size, type, and timing; alternative system configurations; and voltage are not within the [environmental quality] board's siting and routing authority and must not be included in the scope of environmental review conducted under sections 116C.51 to 116C.69.") *See also* Minn. Rules part 4400.1700, subpart 5.

2.1 No-build Alternative

The no-build alternative means that no wind project is constructed.

2.2 100 MW LWECS

In most certificate of need proceedings, where the issue is whether additional electricity is needed to serve certain customers or a certain area, the PUC considers the various means

by which an increased demand for electricity can be met. This usually involves analyzing the impacts associated with construction of new generating facilities burning various fossil fuels, such as coal and natural gas, and the impacts related to construction of new transmission facilities. After the PUC determines the need for a new facility, and the size, type, and timing of that facility, or voltage if the need is for more transmission, the Environmental Quality Board then determines the appropriate site for the new power plant or route for a new transmission line.

In this case, however, where the need is progress toward achieving the Renewable Energy Objective, that kind of comparison is unnecessary. What is appropriate is to evaluate the impacts of a different wind project. Great River Energy received 56 bids for wind energy projects in response to its Request for Proposals, and all of the bids selected for the short-list were wind energy projects. A wind project could be constructed, for example, in another part of the Buffalo Ridge area, or in another part of the state. The analysis here will attempt to describe any differences in the impacts associated with the specific location of the wind project.

2.3 38.5 MW Biomass Plant

The third alternative to be evaluated in this Report is a biomass plant. Biomass includes such materials as trees and plants. A biomass plant would be considered a renewable source of energy and would count toward the state's Renewable Energy Objective.

There are various sources of biomass fuel that could be considered. A proposal was made a few years ago to burn alfalfa. A 50 MW plant is presently under construction in Benson, Minnesota, that will burn turkey litter. However, the biomass alternative that was included for review in this report is one that would burn a combination of hybrid willows, poplars, and corn stover, with natural gas as a backup fuel. This alternative was considered because such a plant has already undergone environmental review in Minnesota and data regarding potential environmental impacts associated with such a plant are already available. Such a biomass plant is more feasible than one burning alfalfa or a second turkey litter plant.

NGPP Minnesota Biomass, LLC, a limited liability company, has proposed a "closed-loop" biomass-fueled power generating plant near Waseca, Minnesota. This plant, expected to be completed in late 2006, will convert approximately 40,000 tons of wood, wood wastes, and agricultural biomass per month into electricity. The electricity will be provided to the Xcel Energy electric grid for distribution to its customers.

Such a plant was reviewed by the Environmental Quality Board in 2003 when it prepared an Environmental Assessment Worksheet on the proposed facility. EQB Docket No. 03-67-EAW-NGP Biomass. The EAW can be found on the EQB webpage at http://www.eqb.state.mn.us/Docket.html?Id=4452

The NGPP project is a 38.5 MW project. Since the Trimont project calls for a capacity of 100 MW, but will have an anticipated capacity factor of 39 percent, the biomass alternative examined in this document is one that would generate 38.5 MW of power.

3.0 Addressing the No-build Alternative

Often, in conducting environmental review, the analysis of the no-build alternative involves a discussion of the environmental impacts of continuing the status quo. For example, with a proposed highway project, the no-build alternative would take into account the impacts associated with continuing to have traffic increase along existing roads and highways and for development to occur along these existing arteries.

For this project, however, it is not so evident what factors should be considered under the no-build alternative. There are no wind turbines in this area now, and if the project is not built, there will be no turbines there in the future. Therefore, no attempt has been made in this Report to evaluate the no-build alternative under every one of the categories spelled out in part 4410.7035 of the rules. Not building the proposed project will simply avoid any potential impacts associated with wind turbines.

Three categories of impacts have been identified if the Trimont wind project is not built. One is the impact not building the project will have on the state's goal to achieve greater production of electricity through renewable resources. The second is the impact not building the project will have on the people and the economy in the Trimont area. And the third is the impact associated with the generation of electricity in a manner other than by the Trimont wind project.

3.1 Renewable Energy Objective

The state's renewable energy objective provides that utilities shall make a good faith effort to provide 10 percent of the electricity used by their retail customers by 2015. Minn. Stat. § 216B.1691, subd. 2, provides as follows:

> Subd. 2. **Eligible energy objectives.** (a) Each electric utility shall make a good faith effort to generate or procure sufficient electricity generated by an eligible energy technology to provide its retail consumers, or the retail customers of a distribution utility to which the electric utility provides wholesale electric service, so that:
>
> (1) commencing in 2005, at least one percent of the electric utility's total retail electric sales is generated by eligible energy technologies;
>
> (2) the amount provided under clause (1) is increased by one percent of the utility's total retail electric sales each year until 2015; and

(3) ten percent of the electric energy provided to retail customers in Minnesota is generated by eligible energy technologies.

In its most recent Integrated Resource Plan, submitted to the PUC in July 2003, GRE says in Table 5-2 of the Plan that it owns generating facilities with a capacity of 2378 MW and has total capacity available (through purchase agreements and other considerations) of 2992 MW. (The GRE Integrated Resource Plan is included with the Trimont Certificate of Need application.) The 100 MW Trimont project is less than 1% of its Renewable Energy Objective. Not building the Trimont project would eliminate these 100 megawatts from the amount of electricity GRE provides from renewable sources.

3.2 Impacts on Trimont Area

Not building the Trimont Project would, of course, impact the farmers and landowners who are part of the Trimont Area Wind Farm company and who anticipate having a wind turbine on their property and receiving annual payments based on the sale of the electricity that is generated. No figures are available for what those payments would be, but the amounts are likely to be in the thousands of dollars annually for each participant.

In the Certificate of Need application at page 11, Trimont discusses the socioeconomic impacts associated with the proposed Project. About 50 to 100 construction jobs will be created over the eight month period required to install the turbines. Three to five permanent jobs are expected. These are jobs that would not be available in the Trimont area if this project were to go elsewhere.

3.3 Replacement Power

If the Trimont Project is not built, the electricity that it would generate would come from somewhere else. And, of course, if the Trimont Project is not built, GRE will have to find another renewable energy project to provide electricity, and there would be a delay in obtaining this 100 MW of renewable energy.

It is possible to perform the math to determine how many additional tons of certain pollutants would be emitted into the atmosphere based on assumptions of what generating facility the electricity were to come from if the Trimont Project were not available. The Minnesota Pollution Control Agency has determined the emission rates per unit of electricity generated for a number of generating facilities in the state. These results are

found in the Energy Planning Report prepared by the Department of Commerce in 2001 at page 95, Figure A-4. That report is available at: http://www.state.mn.us/mn/externalDocs/Energy_Planning_Report_121602022402_2002PlanningRpt.pdf

The Trimont Project is expected to produce about 350,000 MWh per year when it is up and running. If this electricity were replaced by electricity generated at Xcel Energy's Sherco Plant, for example, the additional emissions of NOx, SO2 and CO2, based on the PCA figures in the Planning Report, would be:

550 tons/year of NOx
550 tons/year of SO2
418,000 tons/year of CO2.

(The math is as follows: 350,000 MWh/yr times 0.003 lb NOx/kWh times 1000 kWh/MWh times 1 ton/2000 lbs = 550 tons/yr.) (The emission rate per unit of electricity is the same for both NOx and SO2 and 2.39 lbs per kWh for CO2.) Presently, emissions from existing baseload generating plants in Minnesota total approximately 80,000 tons for NOx, 90,000 tons for SO2, and 34 million tons for CO2.

If GRE were to obtain the replacement electricity from one of its natural gas fired peaking plants, the emissions calculated above would be less, but no effort is made here to make those calculations. Also, generation of electricity has other environmental impacts besides air emissions, but no attempt was made here to quantify those impacts.

4.0 Human and Environmental Impacts

4.1 Emissions

Minn. Rules 4410.7035, subp. 2.A requires the Environmental Report to address the anticipated emissions of the following pollutants at the maximum rated capacity of the project and as an amount produced per kilowatt hour: sulfur dioxide, nitrogen oxides, carbon dioxide, mercury, and particulate matter, including particulate matter under 2.5 microns in diameter. The Environmental Report must also provide the calculations performed to determine the emissions.

4.1.1 100 MW LWECS

A 100 MW LWECS would not result in any emissions of these pollutants.

4.1.2 38.5 MW Biomass Plant

The following information was obtained by Trimont from air permit application documents submitted to the Minnesota Pollution Control Agency (MPCA) in support of the 38.5 MW biomass facility proposed for construction in Waseca, Minnesota. The proposed facility is a generation plant primarily fueled by a combination of hybrid willows, poplars, and corn stover, with natural gas as a backup fuel. The emissions were calculated based on a variety of vendor information and factors obtained from the Environmental Protection Agency (EPA). With the exception of the carbon dioxide emissions calculation, the emissions information presented below was obtained from the MPCA permit application file for the biomass facility. The carbon dioxide emission rate was calculated based on an EPA emission factor of 195 lb/MM Btu heat input.

Table 4.1
Potential Emissions from a 38.5 MW Biomass Plant

		Potential Emissions	
Pollutant	CAS*		
	#	lb/hr	lb/kWh
Sulfur Dioxide (SO2)	7446-09-5	26.37	0.0007
Nitrogen Oxides (NOx)	10102-43-9	79.12	0.0021
Carbon Dioxide (CO2)	NA	102,853	2.6715
Mercury	7439-97-6	1.58E-03	4.11E-08
Particulate Matter (PM)	NA	13.71	0.0004
Particulate Matter <10 microns (PM10)	NA	13.71	0.0004
Particulate Matter <2.5 microns (PM2.5)	NA	13.71	0.0004
(* Chemical Abstracts Services Number)			

4.1.3 Trimont Area Wind Farm

The Trimont Project will not result in any air emissions.

4.2 Hazardous Air Pollutants and VOCs

Minn. Rules 4410.7035, subp. 2.B requires the Environmental Report to address the anticipated emissions of any hazardous air pollutants and volatile organic compounds (VOCs).

4.2.1 100 MW LWECS

Regardless of where it is located, the 100 MW LWECS alternative would not result in any emissions of hazardous air pollutants or volatile organic compounds. There are three types of petroleum-based fluids used in the operation of wind turbines. These fluids are necessary for the operation of each turbine and include: gear box oil (synthetic or mineral depending on application), hydraulic fluid, and gear grease. The very low vapor pressures of these products do not cause the release of any measurable VOCs.

4.2.2 38.5 MW Biomass Plant

The following information was obtained from air permit application documents submitted to the MPCA in support of a 38.5 MW biomass facility proposed for construction in southern Minnesota. The emissions were calculated based on a variety of vendor information and factors obtained from the EPA. Reference to the specific document from

which the emissions information was obtained, or a copy of the backup calculations, is on file at EBQ offices. The emissions information presented below was obtained from the MPCA permit application file for the biomass facility. In the purpose of clarity, it can be summarized that there should be little matter of concern at these low concentrations.

Table 4.2
Potential Hazardous Air Pollutants,
VOCs from a 38.5 MW Biomass Plant

		Potential Emissions	
Pollutant	CAS		
	#	lb/hr	lb/kWh
Volatile Organic Compounds (VOCs)	NA	8.97	0.0002
Acetaldehyde	75-07-0	4.38E-01	1.14E-05
Acetophenone	98-86-2	1.69E-06	4.38E-11
Acrolein	107-02-8	1.22E-02	3.16E-07
Antimony	7440-36-0	4.17E-03	1.08E-07
Arsenic	7440-38-2	1.16E-02	3.01E-07
Benzene	71-43-2	2.22E+00	5.75E-05
Beryllium	7440-41-7	5.80E-04	1.51E-08
Bis (2-Ethylhexyl)phthalate	117-81-7	2.48E-05	6.44E-10
Bromomethane	74-83-9	7.91E-03	2.06E-07
2-Butanone (MEK)	78-93-3	2.85E-03	7.40E-08
Carbon Tetrachloride	56-23-5	2.37E-02	6.17E-07
Cadmium	7440-43-9	2.16E-03	5.62E-08
Chlorine	7882-50-5	4.17E-01	1.08E-05
Chlorobenzene	108-90-7	1.74E-02	4.52E-07
Chloroform	67-66-3	1.48E-02	3.84E-07
Chloromethane	74-87-3	1.21E-02	3.15E-07
Chromium	7440-47-3	1.11E-02	2.88E-07
Cobalt	7440-48-4	3.43E-03	8.91E-08
1,2-Dibromoethene	106-93-4	2.90E-02	7.54E-07
1,2-Dichloroethane	107-06-2	1.53E-02	3.97E-07
Dichloromethane	75-09-2	1.53E-01	3.97E-06
1,2-Dichloropropane	78-87-5	1.74E-02	4.52E-07
2,4-DinitrophenolD	51-28-5	9.49E-05	2.47E-09
Ethylbenzene	100-41-4	1.64E-02	4.25E-07
Formaldehyde	50-00-0	2.32E+00	6.03E-05
Hexane	110-54-3	9.28E-01	2.41E-05
Hydrogen Chloride	7647-01-0	1.05E+01	2.74E-04
Lead	7439-92-1	2.53E-02	6.58E-07
Manganese	7439-96-5	8.44E-01	2.19E-05
Naphthalene	91-20-3	5.12E-02	1.33E-06

		Potential Emissions	
Pollutant	CAS		
	#	lb/hr	lb/kWh
Nickel	NA	1.74E-02	4.52E-07
4-Nitrophenol	100-02-7	5.80E-05	1.51E-09
Pentachlorophenol	87-86-5	2.69E-05	6.99^{E}-10
Phenol	108-95-2	7.75E-03	2.01E-07
Phosphorous	7723-14-0	1.42E-02	3.70E-07
Polycyclic Organic Matter (POM)	NA	6.58E-02	1.71E-06
Propionaldehyde	123-38-6	3.22E-02	8.36E-07
Selenium	7782-49-2	1.48E-03	3.84E-08
Styrene	100-42-5	1.00E+00	2.60E-05
2,3,7,8-Tetrachlorodibenzo-p-dioxins	1746-01-6	4.54E-09	1.18E-13
Toluene	108-88-3	7.91E-03	2.06E-07
1,1,1-Trichloroethane	71-55-6	1.64E-02	4.25E-07
Trichloroethylene	79-01-6	1.58E-02	4.11E-07
2,4,6-TrichlorophenolD	88-06-2	1.16E-05	3.01E-10
Vinyl Chloride	75-01-4	9.49E-03	2.47E-07
o-Xylene	95-47-6	1.32E-02	3.43E-07

4.2.3 Trimont Area Wind Farm

EQB does not anticipate the release of emissions of hazardous air pollutants or volatile organic compounds from the Project. There will be three types of fluids used in the operation of the wind turbines that are petroleum products. These fluids are necessary for the operation of each turbine and include: gear box oil (synthetic or mineral depending on application), hydraulic fluid, and gear grease. The very low vapor pressures of these products will not cause the release of any measurable VOCs.

4.3 Visibility Impairment

Minn. Rules 4410.7035, subp. 2.C requires the Environmental Report to address the anticipated contribution of the project to impairment of visibility within a 50-mile radius.

4.3.1 100 MW LWECS

The installation of a 100-MW LWECS will alter the visual environment. By one measure of standards, the 100-MW LWECS could be perceived as an industrial visual intrusion, characterized by metal structures intruding on the natural aesthetic value of the landscape. On the other hand, wind farms have their own aesthetic quality, distinguishing them from

other non-agricultural land uses. The land use would not involve any ongoing industrial use of non-renewable resources or emissions into the environment. The area would retain the rural sense and remote characteristic of the vicinity. The turbines are a new feature on the landscape and are compatible with the rural, agricultural heritage of Minnesota.

Wind projects in Minnesota are located in rural areas with open space and minimal tree cover because these sites minimize energy losses due to surface roughness. A 100 MW LWECS would include the addition of wind turbines, access roads, operations and maintenance facility, electrical transformer and lines, and substation. A typical l00 MW project would occupy approximately 40 acres. A potential impact of placing an equivalent wind farm in a place other than Trimont is the possibility of requiring different size turbines or a larger number of turbines, depending on whether the wind resource was greater or lesser than the Trimont site.

A 100 MW LWECS would typically require up to 67 turbines, assuming 1.5 MW generators. Currently, the hub height of the towers is approximately 70 to 80 meters (230 to 262 feet), and the rotor diameter is 70 to 82 meter (231 to 269 feet). Assuming an 80-meter tower height and a rotor diameter of 82 meters, the turbine height from the ground to the tip of the blade would be 121 meters (397 feet). The towers are conical tubular steel, and the blades are composite material.

Other visual characteristics include turbine lighting, as required by 49 CFR Part 77, FAA Advisory Circular – AC 70/7460. In general, turbines on the perimeter of the wind project are lighted using dual lights. This system consists of red lights for nighttime and medium intensity flashing white lights for daytime and twilight.

Access roads are typically single-lane, low profile, gravel roads. Operations and maintenance facility buildings are typically 2,000 square feet pole barns that house the necessary equipment to operate and maintain the site.

4.3.2 38.5 MW Biomass Plant

A 38.5 MW biomass plant would be visible from all directions and have an industrial characteristic. The stack would be approximately 150 feet tall and the boiler house would be approximately 130 feet tall. The conveyors used for handling fuel would rise at an incline between the fuel handling area and the boiler. The conveyors would be lighted at night to allow for continuous operation of the plant. A transmission line would connect the plant to the transmission grid.

The plant, associated buildings and parking would cover approximately 10 acres, and the wood storage area would cover approximately 50 acres. A large portion of the site would be used for fuel storage. Fuels may include wood, wood waste materials, and agricultural biomass (corn stover and other biomass fuels).

The exhaust gas would have little particulate matter, so plumes or vapor clouds would not be visible from exhaust stacks for most of the year. On some occasions, particularly in cold weather, a water vapor plume from the exhaust stack may be visible. In addition to the vapor plume from the exhaust stack, a plume from the cooling tower may also be visible during periods of high humidity.

Stack lighting would be necessary and would conform with the current FAA Advisory Circular – AC 70/7460 and FAA recommendations for obstruction marking and lighting. Exterior lighting would be sufficient to allow 24-hour operation of the fuel handling system. Minor maintenance and walk down inspections of the conveyor systems would be required during all shifts of the 24-hour period. Exterior lighting is anticipated for all conveyor walkways and stackout and reclaim areas. Lighting would also be required at all fuel receiving points, scales and vehicle access roadways, and parking areas.

The 38.5 MW biomass plant would be an industrial facility that includes a 150-foot tall stack and 130-foot tall boiler plant. The site for the biomass plant does not require a rural, open space, and it may be situated in a more urban or industrial setting. The project would require approximately 50 acres of contiguous land for the site, which will primarily be used for fuel storage. Lighting for the stack and facility, to allow for 24-hour operation, would add to the industrial quality of the facility. Vapor plumes may be visible during cold or humid weather from the exhaust stack and cooling tower.

4.3.3 Trimont Area Wind Farm

Although the Project area contains both a 345 kV transmission line and the Lakefield Junction Generating Station, the predominant character of the Project area is rural. The installation of the Trimont Project will alter the visual environment of the rural area. The Project would include up to 67 wind turbine generators that will alter the landscape. However, wind farms have their own aesthetic quality, distinguishing them from other non-agricultural land uses. The predominant existing land use would remain rural. The area would retain the rural sense and remote characteristic of the vicinity. Although the turbines are new features on the landscape, they are compatible with the rural, agricultural

heritage of Minnesota. The wind turbines would be visible on the horizon for a distance up to approximately five miles. The project site is spread across 22,400 acres.

Visual characteristics include turbine lighting, as required by 49 CFR Part 77, FAA Advisory Circular – AC 70/7460. In general, turbines on the perimeter of the wind project are lighted using dual lights. This system consists of red lights for nighttime and medium intensity flashing white lights for daytime and twilight. Access roads are typically single-lane, low profile, gravel roads. Operations and maintenance facility buildings are typically 2,000 square feet pole barns that house the necessary equipment to operate and maintain the site.

4.4 Ozone Formation

Minn. Rules 4410.7035, subp. 2.D requires the Environmental Report to address the anticipated contribution of the project to the formation of ozone expressed as reactive organic gases. Reactive organic gases are chemicals that are precursors necessary to the formation of ground level ozone.

4.4.1 100 MW LWECS

Wind projects do not produce reactive organic gases. A 100 MW LWECS would not contribute to ozone formation

4.4.2 38.5 MW Biomass Plant

Based on the information presented in Sections 4.1.2 and 4.2.2 above, the potential NOx and VOC emissions are 347 tons per year and 39 tons per year, respectively. The proposed project area is designated as attainment for ozone by EPA for the current 1-hour standard and, based on ambient monitoring data, is expected to remain in attainment status when the new 8-hour standard becomes effective. Therefore, given the location of the proposed project (rural southwestern Minnesota) and the current attainment status of the area, ground level ozone is not a concern.

4.4.3 Trimont Area Wind Farm

The Trimont Project would not produce reactive organic gases and would not contribute to ozone formation.

4.5 Fuel Availability and Delivery

Minn. Rules 4410.7035, subp. 2.E requires the Environmental Report to address the availability of the source of fuel for the project, the amount required annually, and the method of transportation to get the fuel to the plant.

4.5.1 100 MW LWECS

Wind projects do not require any fuel besides wind. The actual availability of wind varies considerably across Minnesota, and has been analyzed by the Minnesota Department of Commerce. Reference the historical documentation of Minnesota's wind resources, "Wind Resource Analysis Program 2002," by reviewing the report on their website at http://www.state.mn.us/mn/externalDocs/WRAP_Report_110702040352_WRAP2002.pdf.

Wind is classified according to wind power classes, which are based on typical wind speeds. These classes range from class 1 (the lowest) to class 7 (the highest). Wind power resources of class 4 or higher are typical for utility scale wind projects.

4.5.2 38.5 MW Biomass Plant

A representative 38.5 MW steam turbine biomass plant would use approximately 40,000 tons of wood, wood wastes, and agricultural biomass materials per month. Fuel would most likely be delivered by truck using the existing highway network. The frequency of trucks is dependent on the demand for materials and the available payload of each vehicle. An average flow of three to five semi-combination vehicles per hour would be typical for such a facility. The origin of loaded trucks and the destination of empty trucks would depend upon the location of the fuel source.

A biomass plant would most likely have some backup fuel available for startup or in the event that the biomass fuel supply was interrupted. Backup fuel may be natural gas or fuel oil. Natural gas would be delivered by a pipeline, and fuel oil would be delivered by truck.

4.5.3 Trimont Area Wind Farm

The Trimont Project requires no fuel. Instead, it is dependent on converting wind energy to electricity at the site. The estimated average annual wind speed (in meters/second and miles/hour) at the Project site from 1995 to 2003 was 7.7 m/s (17.2 mph), with a range of 7.1 to 8.0 m/s (15.9 to 17.9 mph). These wind speeds are in the class 4 range.

4.6 Associated Transmission Facilities

Minn. Rules 4410.7035, subp. 2.F requires the Environmental Report to address associated facilities that would be required to transmit electricity to customers.

4.6.1 100 MW LWECS

A 100 MW LWECS alternative may require new electric transmission facilities to move the power to customers. A transformer is typically installed at the base of each turbine to raise the voltage to distribution line voltage, usually 34.5 kV. Power is typically run through an underground collection system, buried in trenches adjacent to project access roads, to the project feeder system. The feeder system delivers the power from the wind farm to a substation. At the substation the electric voltage is stepped up to transmission level voltage (69 kV or greater) and enters the grid.

4.6.2 38.5 MW Biomass Plant

The 38.5 MW biomass plant alternative could require new transmission facilities to provide power to customers. Transmission requirements would most likely include a transformer at the plant to step the voltage up to transmission levels and a transmission line between the plant and a substation where the power would enter the grid.

4.6.3 Trimont Area Wind Farm

No additional transmission lines are required for this Project. The Project was selected in part due to the fact no new transmission facilities will be required. Xcel Energy's 345 kV Willmarth – Lakefield Junction transmission line runs diagonally through the Trimont Wind Project area from southwest to northeast. In addition, within the project area is the Martin County Substation located adjacent to the GRE Lakefield Generating Station. The Trimont Wind Project will have a project feeder electrical system that will feed power to the point of interconnection, and a wind farm substation. At the wind farm substation, the electric voltage will be stepped up to transmission level voltage, which is expected to be 345 kV. The power will then be delivered to the Xcel Energy's Martin County Substation, adjacent to GRE's Lakefield Junction Generating Station, where it will enter the grid.

4.7 Water Appropriations

Minn. Rules 4410.7035, subp. 2.G, requires the Environmental Report to address the anticipated amount of water that will be appropriated to operate the plant and the source of the water if known.

4.7.1 100 MW LWECS

A 100 MW LWECS alternative would typically require some water appropriations to supply potable and sanitary water to the project's operations and maintenance facility. Because of the project's rural location, water would need to be supplied either through a rural water supply system or, more typically, construction of a single domestic-sized well. The source of the water will depend upon the location of the project.

4.7.2 38.5. MW Biomass Plant

The 38.5 MW biomass plant alternative will require water for both process and sanitary purposes. Project water could come from well water or city water. In addition to well water or city water effluent from a wastewater treatment plant could be used for cooling tower makeup, and possibly for other process water.

The amount of water used would depend upon the plant equipment and the water quality. A biomass facility currently in the permitting phase anticipates an average water flow of between 56.5 to 592 gallons per minute (gpm) and maximum water flows of between 567 to 592 gpm. Water use would be on the lower end of that range if effluent were used for part of the process water and on the upper edge of that range if only well water or city water is used. The source for the water would depend upon availability of water sources in the project area.

4.7.3 Trimont Area Wind Farm

The Trimont Project requires water appropriations for potable and sanitary water for the operations and maintenance facility. Water will be supplied through either rural water or a single domestic sized well.

4.8 Wastewater

Minn. Rules 4410.7035, subp. 2. H, requires the Environmental Report to address the potential wastewater streams and the types of discharges associated with such a project including potential impacts of a thermal discharge.

4.8.1 100 MW LWECS

A 100 W LWECS would only generate wastewater at the operations and maintenance facility. Wastewater would be from the sanitary system and minor equipment

maintenance. The wastewater would be disposed of in a septic system or sanitary sewer system.

4.8.2 38.5. MW Biomass Plant

A 38.5 MW biomass plant would generate wastewater from the following sources:

Table 4.3
Potential Wastewater Streams, Discharges from 38.5 MW Biomass Plant

	Well Water	
Wastewater Source	**gpm**	**Million gpy**
Cooling Tower Blowdown	136.0	71.5
Sanitary	1.0	0.5
Plant Wash & Misc.	13.0	6.8
Demineralization	3.5	1.8
Oil/Water Separation	2.0	1.1
Total Discharge	155.5	81.7

The wastewater from a 38.5 MW biomass plant could be discharged without pretreatment to a municipal wastewater treatment facility with available capacity. It is also possible to approach zero discharge, but there would still be some wastewater associated with the cooling tower blowdown and boilers. The wastewater would include minerals and sanitizers, and have an increased temperature. The wastewater would be discharged to a holding pond where it would evaporate or infiltrate. The wastewater stream would be contained and not impact surface water resources. Sanitary wastewater would be disposed of in a septic system or sanitary sewer system.

4.8.3 Trimont Area Wind Farm

The Trimont Project will generate wastewater at the operations and maintenance facility. Wastewater would be from the sanitary system and minor equipment maintenance, and it would be disposed of through a septic system.

4.9 Solid and Hazardous Wastes

Minn. Rules 4410.7035, subp. 2.I, requires that the Environmental Report address the types and amounts of solid and hazardous wastes generated by the project, including potential impacts of a thermal discharge.

4.9.1 100 MW LWECS

The 100 MW LWECS alternative would generate solid waste during the construction of the facility. Material will be disposed of in an appropriate landfill facility. There will be a small amount of solid waste during operations of the facility that will be disposed of appropriately. Wind turbines require three types of petroleum-based fluids for operation: gear box oil, hydraulic fluid, and gear grease. All fluids will be contained within the wind turbine structure.

The 100 MW wind project alternative would generate some very small quantities of hazardous wastes that may include fluorescent lights, lubricating oil, ethylene glycol, de-greasers, cleaning solvents, and batteries. Hazardous waste generation would fall below the quantity of a small quantities generator (220 pounds per month).

4.9.2 38.5. MW Biomass Plant

The 38.5 MW biomass plant alternative would generate solid wastes during construction. The solid waste will include normal construction debris such as, scrap wood, plastics, wallboard, packing material, cardboard, scrap metals, and electrical wires. No hazardous waste would be anticipated from project construction. A biomass facility would generate ash from fuel combustion. Typically ash would be collected and stored on site in an ash storage building. The ash will be removed periodically and re-used as a soil enhancer or disposed at an off-site solid waste disposal facility.

The biomass alternative would generate very small quantities of hazardous wastes that may include fluorescent lights, lubricating oil, mineral oil, ethylene glycol, de-greasers, cleaning solvents, and batteries. It is anticipated that the facility would be classified as a "Very Small Quantity Generator" of hazardous wastes.

4.9.3 Trimont Area Wind Farm

The Trimont Project will generate solid waste during the construction of the facility. Material will be disposed of in an appropriate landfill facility. There will be a small amount of solid waste created during operations of the facility that will be disposed of appropriately. Used parts or other equipment will generally be rebuilt or recycled.

There will be three types of fluids used in the operation of the wind turbines that are petroleum products (gear box oil, hydraulic fluid, and gear grease). All fluids will be contained within the wind turbine structure.

The Trimont Project would generate some very small quantities of hazardous wastes during operations that may include fluorescent lights, lubricating oil, ethylene glycol, de-greasers, cleaning solvents, and batteries. Hazardous waste generation would fall below the quantity of a small quantities generator (220 pound per month). Any wastes, fluids or pollutants generated during the Project will be handled, processed, treated, stored and disposed of in accordance with Minnesota Rules Chapter 7045.

4.10 Noise

Minn. Rules 4410.7035, subp. 2.J requires the Environmental Report to address anticipated noise impacts of a project, including the distance to the closest receptor where state noise standards can still be met.

4.10.1 100 MW LWECS

A 100-MW LWECS will create sources of additional noise. The sound level varies with the speed of the turbine and the proximity of the receptor. Sound is generated from the wind turbine at points near the hub or nacelle, from the blade rotation, and from transformers near ground level.

The representative sound power level (L_p) of the GE 1.5 MW wind turbine is 104.5 dBA, and it was converted to a sound pressure level for comparison to the Minnesota Daytime and Nighttime L_{10} and L_{50} Standards given in Minn. Rules 7030.0040. Turbines were modeled using the following equation for a hemispherical point source: $L_p = L_w - 10 \log (2*pi*r^2)-A_{atm}$ where L_p is defined as the sound pressure level at the distance of interest (r), L_w is the sound power level provided by the turbine manufacturer for a 1.5 MW turbine, and A_{atm} defined as the attenuation provided by atmospheric absorption.

The maximum distance calculated where an exceedence of a state noise standard would no longer occur is 623 feet for the Nighttime L_{50} standard of 50 dBA. Due to the possibility of cumulative noise levels being generated by the operation of multiple turbines, no turbines should be sited within 672 feet of an occupied residence in order to avoid exceeding the MPCA Nighttime L_{50} Standard (Minn. Rules 7030.0040).

4.10.2 38.5. MW Biomass Plant

A 38.5 MW biomass plant is predicted to produce operational noise from a variety of sources including the turbine/boiler building operations, conveyor/reclaiming system,

hammer mill and bale choppers, front end loaders, and idling trucks. The stationary equipment will be housed in buildings or enclosures designed to provide additional noise attenuation.

During peak hour operations, noise emissions from the facility are assumed to be steady state. Under steady state conditions, the modeling results are considered to be equivalent to an L_{50} (the average sound level). Also under steady state noise emission conditions, an L_{10} value is approximately 3 dB higher than an L_{50} value. Therefore, noise modeling results were directly compared to MPCA daytime and nighttime L_{50} limits.

The maximum distance calculated where an exceedence of a state noise standard would no longer occur is 2,100 feet for the Daytime L_{50} standard of 60 dBA, and 6,200 feet for the Nighttime L_{50} standard of 50 dBA. This is a conservative estimated of maximum distance that has not adjusted for shielding or soft-ground attenuation in the noise model. This distance is also based on maximum operation of equipment, and actual operation levels may vary. Decreased operations activity will result in decreased noise levels and shorter maximum distances.

4.10.3 Trimont Wind Farm

The Trimont Project would generate noise from the wind turbines at points near the hub or nacelle, from the blade rotation, and from motors near ground level. The maximum distance calculated where an exceedence of a state noise standard would no longer occur is 623 feet for the Nighttime L_{50} standard of 50 dBA. Due to the possibility of cumulative noise levels being generated by the operation of multiple turbines, no turbines should be sited within 672 feet of an occupied residence in order to avoid exceeding the MPCA Nighttime L_{50} Standard (Minn. Rule 7030.0040).

5.0 Mitigative Measures

Minn. Rules 4410.7035, subp. 1.E, requires the Environmental Report to provide an analysis of mitigative measures that could reasonably be implemented to eliminate or minimize any adverse impacts identified for the proposed project and each alternative analyzed.

5.1 No-build Alternative

The No-build alternative will have no impacts and mitigative measures are not necessary.

5.2 100 MW LWECS

A 100 MW LWECS will have no significant impacts and mitigative measures are generally not necessary for the following issues: air emissions, hazardous air pollutants and volatile organic compounds, ozone formation, fuel availability and delivery, transmission facilities (although another project might require new transmission), water appropriations, and wastewater.

The potential mitigation for visibility impairment at a 100 MW LWECS must be balanced with maximizing turbine efficiency and exposure to wind. Mitigation measures that would result in shorter towers or placement of the turbines at alternate locations off the ridgelines would result in less efficiency per unit. Mitigative measures for a 100 MW LWECS would include the following:

- Turbines will not be located in biologically sensitive areas such as wetlands or relic prairies.
- Turbines will be illuminated to meet the minimum requirements of FAA regulations.
- Existing roads will be used for construction and maintenance where possible. Road construction will be minimized.
- Access roads created for the wind farm facility will be located on gentle grades to minimize visible cuts and fills.
- Temporarily disturbed areas will be reseeded to blend in with existing vegetation.

Mitigative measures for solid wastes at a 100 MW LWECS would include appropriate disposal of construction and facility operation wastes at a licensed landfill. A 100 MW LWECS may generate very small quantities of hazardous wastes during the life of the Project. Mitigative measures for hazardous wastes would include appropriate handling, processing, storage, and disposal of wastes in accordance with Minnesota Rules Chapter 7045.

Mitigative measures for noise at a 100 MW LWECS would include not siting turbines within 672 feet of an occupied residence in order to avoid exceeding the MPCA Nighttime L_{50} Standard (Minn. Rules 7030.0040).

5.3 38.5 MW Biomass Plant

Although the biomass plant will be equipped with state of the art control equipment, technologies exist that would potentially decrease potential emissions. However, these alternate control technologies have a number of drawbacks as compared to the proposed equipment, such as cost, technological issues, and adverse environmental impacts.

Many of the visual impacts from the biomass alternative can be mitigated by locating the facility in an industrial or rural area with good access to transportation. Fuel storage can be used to provide a visual buffer between the facility and some of the surrounding land uses. Locating the facility near existing transmission facilities can reduce visual impacts from transmission lines.

Mitigation strategies available to reduce water appropriations will depend upon the water source. Where appropriate, water appropriations can be reduced by cycling water through some of the plant processes multiple times as long as water quality is maintained. Effluent from wastewater treatment can be used in some instances to reduce ground- or surface-water appropriations.

Wastewater streams can be reduced, though not entirely eliminated, through use of evaporative or infiltration holding ponds. The use of holding ponds would also eliminate potential for impacts from a thermal discharge directly to a water body.

Mitigative measures for solid wastes at the 38.5 MW biomass facility alternative would include disposal of construction and facility operation wastes at an appropriate landfill and re-use of the ash as a soil enhancer or disposal of the ash at an off-site solid waste disposal facility.

It is expected that the 38.5 MW biomass facility alternative would be classified as a "Very Small Quantity Generator" of hazardous wastes. Any wastes, fluids or pollutants generated during the Project will be handled, processed, treated, stored, and disposed of in accordance with Minnesota Rules Chapter 7045.

Locating the facility away from sensitive receptors can mitigate noise impacts. Enclosure of some of the heavy equipment will reduce noise impacts to surrounding land uses. Fuel windrows can be located to provide noise attenuation to reduce the impacts from operations noise to sensitive receptors. Limiting the hours of fuel delivery and heavy equipment operation can also reduce noise impacts.

5.4 Trimont Area Wind Farm

The Trimont Project will have no significant impacts and mitigative measures are not necessary for the following issues: air emissions, hazardous air pollutants and volatile organic compounds, ozone formation, fuel availability and delivery, transmission facilities, water appropriations, and wastewater.

The potential mitigation for visibility impairment at the Trimont Project must be balanced with maximizing turbine efficiency and exposure to wind. Mitigation measures that would result in shorter towers or placement of the turbines at alternate locations off the ridgelines would result in less efficiency per unit. Mitigative measures for Trimont Wind Project will include the following:

- Turbines will not be located in biologically sensitive areas such as wetlands or relic prairies.
- Turbines will be illuminated for safety to meet the minimum requirements of FAA regulations.
- Existing roads will be used for construction and maintenance where possible. Road construction will be minimized.
- Access roads created for the wind farm facility will be located on gentle grades to minimize visible cuts and fills.
- Temporarily disturbed areas will be reseeded to blend in with existing vegetation.

Mitigative measures for solid wastes at the Trimont Project will include appropriate disposal of construction and facility operation wastes at a licensed landfill. The Trimont Project may generate very small quantities of hazardous wastes during the life of the Project. Mitigative measures for hazardous wastes would include appropriate handling, processing, storage and disposal of wastes in accordance with Minnesota Rules Chapter 7045.

Mitigative measures for noise at the Trimont Project will include not siting turbines within 672 feet of an occupied residence in order to avoid exceeding the MPCA Nighttime L_{50} Standard (Minn. Rule 7030.0040).

6.0 Feasibility and Availability of Alternatives

Minn. Rules 4410.7035, subp. 1.F requires that the environmental report address the feasibility and availability of each alternative analyzed.

6.1 No-build Alternative

The No-build alternative is available, but would not help GRE meet the state's REO.

6.2 100 MW LWECS

Minnesota's wind resources are more than sufficient to support a 100 MW LWECS, but EQB is unaware of any specific 100 MW projects that are currently available to meet GRE's needs.

6.3 38.5 MW Biomass Facility

A 38.5 MW biomass facility alternative is feasible. A 38.5 MW biomass project underwent environmental review in late 2003. However, EQB is not aware of any large biomass projects that are currently available to meet GRE's needs.

6.4 Trimont Area Wind Farm

The Trimont Project is feasible and could be developed to help GRE meet the state's REO.

7.0 Required Permits

The federal and state permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 7.1.

Table 7.1
Permits and Approvals Required for Construction and Operation

Agency	Type of Approval
Federal	
Federal Aviation Administration	Notice of Proposed Construction or Alteration within six miles of Public Aviation Facility and structures over 200 feet to complete a 7460 Proposed Construction or Alteration Form
U.S. Army Corps of Engineers	Section 404 Permit
State of Minnesota	
Minnesota Board of Water and Soil Resources	Wetland Conservation Act Approval
Minnesota Environmental Quality Board	Site Permit
Minnesota Department of Natural Resources	Pubic Water Works
	License to Cross Public Lands and Waters
Minnesota Pollution Control Agency	NPDES Permit: Construction
	License for Very Small-Quantity Generator of Hazardous Waste
Minnesota Department of Health	Water Well Permit
	Plumbing Plan Review
Minnesota Public Utilities Commission	Certificate of Need
Local Permits	
Jackson County	Building Permits
	Individual Septic Tank Systems (ISTS) Permit
	Driveway Permit
	Utility Permit
	Moving Permit
Martin County	Building Permits
	ISTS Permit
	Driveway Permit
	Utility Permit
	Overwidth/Overweight Permit
Townships	Road Access Permits

8.0 Other Matters Identified by Chair

Minn. Rules 4410.7035, subp. 1.H allows that the environmental report address other issues as identified by the Chair.

8.1 Displaced Land Use and Value

In meetings, and in comments received by staff, the issues of land value and displaced land use were brought forward. Concerns exist over potential devaluation of property in and adjacent to the proposed wind project. However, according to a study published in October 2002, "*Economic Impacts of Wind Power in Kittitas County, Final Report*," conducted by Dr. Stephen Grover of ECONorthwest of Portland, OR:

> "Views of wind turbines will not negatively impact property values. Based on a nation-wide survey conducted of tax assessors in other areas with wind power projects, we found no evidence supporting the claim that views of wind farms decrease property values."

Issues of conservation of waterfowl and wildlife areas and native prairie areas with the project remain. These concerns must be addressed in the EQB permitting process.

8.2 Future Development Opportunity for Non-participants

Another concern of local landowners is lost opportunity in conservation and natural land uses and sales. One landowner contends that his discussions with U.S. Fish and Wildlife Service staff lead him to believe location in or near a wind farm will diminish his options for wetland or prairie sales or conservation easements. The owner further contends that TAWF would significantly affect waterfowl migratory patterns negatively impacting potential leasing of hunting rights.

Many owners expressed concern over protecting their own future economic opportunities with wind energy. Concerns addressed protecting their wind rights from encroachment of accumulated wake losses from the project. The protection and requirement of wind rights, legal property setbacks, and turbine locations guaranteeing responsible use of resources all will be addressed in the EQB permitting process. The application and siting processes of the EQB in wind development in Minnesota have always addressed these same issues.